United States
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Animal and
Plant Health
Inspection
Service

**National Wildlife
Research Center**

Wildlife Services Seeking Solutions Through Research

Reducing Wildlife Damage With Chemistry Research

Contact Information:
Dr. John Johnston, Wildlife Services Research Chemist
NWRC Headquarters
4101 LaPorte Avenue
Fort Collins, CO 80521
Phone: (970) 266-6082 FAX: (970) 266-6063
E-mail: john.j.johnston@aphis.usda.gov
Web site: www.aphis.usda.gov/ws/nwrc

National Wildlife Research Center Scientists Use Chemistry to Resolve Wildlife Damage

Wildlife Services' (WS) National Wildlife Research Center (NWRC) is the only Federal research facility devoted exclusively to resolving conflicts between people and wildlife through the development of effective, selective, and acceptable methods, tools, and techniques.

Due to the increasing need for new, federally approved chemical tools that can be used by wildlife damage management professionals, NWRC scientists have begun a project devoted to developing methodologies to analyze drugs, repellants, pesticides, and other chemical-based wildlife damage management tools. These methodologies are used to support U.S. Environmental Protection Agency (EPA) and U.S. Food and Drug Administration (FDA) registration requirements. NWRC scientists have experience in a variety of scientific disciplines, including metabolism chemistry, environmental fate, chemical synthesis, toxicology, chemical ecology, and formulation chemistry.

Studies include, but are not limited to:

1. Developing alternative chemical tools (toxicants, repellants, contraceptives, and attractants) to reduce bird damage to rice and sunflower crops, and to control Canada geese in urban and suburban settings.

2. Developing DNA fingerprinting to census densities of problem wildlife species.

3. Identifying existing products or naturally-occurring chemicals in plants that could be used to protect against wildlife damage.

4. Developing formulations for increasing the effectiveness of wildlife damage management chemicals already in use.

The ultimate goal of these studies is to provide the data needed by EPA and FDA to successfully register new chemicals for use as wildlife damage management tools.

Groups Affected By These Problems:

- U.S. citizens
- Agricultural producers
- Consumers of agricultural products
- Industry groups
- Wildlife and natural resource managers

Major Research Accomplishments:

- WS developed a unique High Performance Liquid Chromatography/Mass Spectrometer analytical method to identify degradation pathways for CPTH, a bird management chemical.
- WS developed analytical methods and generated chemistry data required for EPA registration of acetaminophen as a brown tree snake toxicant.
- WS developed methodology to quantify organochlorine pesticides in wildlife plasma and tissue.
- WS established a fully operational radio-isotope laboratory at NWRC's Wildlife Science Building.

"Solutions to Problems Depend Upon Knowledge Which Only Research Can Provide"

Applying Science and Expertise to Wildlife Challenges

Radio-Tracer Techniques—Scientists are using NWRC's state-of-the-art radio-isotope laboratory to develop techniques for better understanding the metabolism, residues, degradation pathways, and mode of action for various chemical compounds of interest to APHIS.

Identification of Compounds—In an effort to develop an effective, naturally-occurring bird repellant, NWRC scientists are analyzing unripe fruit to identify the chemical cue that masks sweetness and then disappears when the fruit ripens. Scientists will also identify chemical cues in trees that attract bears and chemical compounds in manufactured materials that attract vultures and rodents. These compounds will be determined through the use of advanced technology and specialized equipment at NWRC laboratories.

Analytical Methods for Risk Assessment—NWRC chemists in Fort Collins, CO, are developing new or improved methods for determining the risk to nontarget animals posed by chemicals developed to reduce damage caused by a variety of wildlife species. The residue data generated with these methods are critical for assuring that the proposed uses of these tools are accompanied by minimal risk to nontarget animals. For example, Center chemists are analyzing nontarget and target birds that were collected from DRC-1339-baited sunflower and rice fields and looking for chemical residues. Their findings suggest that birds feeding on DRC-1339-baited fields pose little risk to scavenging or predatory wildlife that may potentially consume these birds. Similar analytical approaches are being used to assess the safety of using acetaminophen to manage brown tree snakes on Guam, using anthraquinone to reduce bird damage to lettuce and rice, and using diphacinone to control rats in Hawaii. These data and the associated risk assessments must be supplied to regulatory agencies to assure that these chemical-based wildlife damage management tools are available for use.

Chemistry Support for NWRC Scientists—NWRC's Analytical Chemistry Laboratory provides support for all research projects being conducted at the center's headquarters in Fort Collins and at the center's 8 research field stations located throughout the United States. This chemistry assistance supports a number of research programs, including avian infertility; bovine tuberculosis; rabies; wildlife hazards to aviation; wildlife damage to forest resources; bird damage to rice, sunflowers, and aquaculture; and waterfowl disease.

Selected Publications:

- Mauldin, R.E., T.M. Primus, S.A. Volz, B.A. Kimball, J.J. Johnston, J.L. Cummings, and D.L. York. 2002. Determination of anthraquinone in technical material, formulations, and lettuce by high performance liquid chromatography. *Journal of Agricultural and Food Chemistry* 50(13):3632-3636.
- Volz, S.A., and J.J. Johnston. 2002. Solid phase extraction/gas chromatography/electron capture detector method for determination of organochlorine pesticides in wildlife and wildlife food sources. *Journal of Separation Science* 25:119-124.
- Kimball, B.A., J.R. Mason, F.S. Blom, J.J. Johnston, and D.E. Zemlicka. 2000. Development and Testing of Seven New Synthetic Coyote Attractants. *Journal of Agricultural and Food Chemistry* 48(5):1892-1897.
- Johnston, J.J., D.A. Goldade, D.J. Kohler, and J.L. Cummings. 2000. Determination of white phosphorus residues in ducks-an atomic emission detection based method of generating residue data for risk assessment and environmental monitoring. Environmental Science and Technology 34:1856-1861.
- Johnston, J.J., R.E. Mauldin, P.J. Savarie, J.E. Brooks, and T.M. Primus. 2000. Extoxicological risks of potential toxicants for brown tree snake control on Guam. Pp. 212-214. Pesticides and Wildlife, Johnston, J.J., editor. ACS Symposium Series, American Chemical Society: Washington D.C.